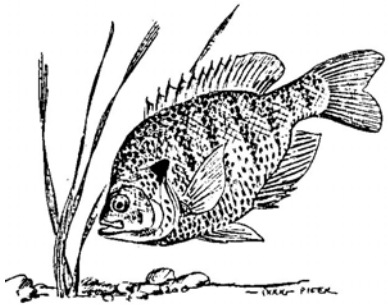
FISHING PRESSURE, FISH HARVEST, AND ECONOMIC VALUE OF WEST BOGGS CREEK RESERVOIR FISHERY

2004 Fish Management Report

David S. Kittaka
Fisheries Biologist



FISHERIES SECTION
INDIANA DEPARTMENT OF NATURAL RESOURCES
DIVISION OF FISH AND WILDLIFE
I.G.C. South, Room W273
402 W. Washington Street
Indianapolis, Indiana 46204

2005

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

FISHING PRESSURE, FISH HARVEST, AND ECONOMIC VALUE OF WEST BOGGS CREEK RESERVOIR FISHERY

Fish Management Report

2004

INTRODUCTION

West Boggs Creek Reservoir is a 622-acre multipurpose impoundment located in Daviess County. The lake was constructed in 1971 with federal funds appropriated under Public Law 566. Operation of the reservoir and park is administered by the Daviess-Martin Joint County Parks and Recreation Department. Facilities at the park include a boat ramp, boat rental concession, boat mooring sites, shoreline fishing area, disabled fishing pier, beach, and campground. Fees are assessed both for entrance to the park and use of the boat ramp.

West Boggs provided excellent fishing for several years after impoundment. Unfortunately, gizzard shad became established during the late 1970's. By the early 1980's the gizzard shad population approached its maximum level resulting in negative impacts to the sport fishery. Impacts included competition with more desirable species and diversion of largemouth bass predation away from the sunfish and carp populations. Hybrid striped bass were stocked in 1984 to help utilize a portion of the abundant gizzard shad. However, a fishery survey in 1985 suggested the stocking was only partially successful. Another fishery survey in 1987 revealed a decline in gizzard shad relative abundance, but an increase in yellow bass and carp populations. Due to the increase in undesirable fish species and support from the public, plans were approved to renovate the watershed and lake with the target species being gizzard shad, carp, and yellow bass. To establish a qualitative measure of the fishery, a creel survey was conducted in 1989 prior to the renovation of West Boggs Creek.

Largemouth bass, bluegill, redear, channel catfish, and black crappie were stocked between 1994 and 1996 following the renovation. Beginning in 1997, channel catfish are stocked on odd years at a rate of five, 8-inch fingerlings per acre (3,110 fingerlings). In 1997, another survey was conducted to determine the success of the renovation. Albers and Andrews (1998) reported the renovation successfully eliminated the once prevalent gizzard shad, carp, and yellow bass. The stocked game fish exhibited above average growth due to abundant food and space. Further evaluation of the fishery was needed to gain insight as to the change in the usage of the resource by anglers. A creel survey was conducted in 1999 to acquire angler usage, fish harvest, fishing preference, and trip satisfaction. In 2002, there was a considerable winter-kill of gizzard shad. A fisheries survey in 2003 confirmed that a viable population of shad exists in the lake.

This report is a summary of the 2004 creel survey and the results of the June 14, 2004 spot check fishery survey.

METHODS

The direct contact creel survey was conducted following the guidelines established by Hudson and Shipman (1980). From April to October of 2004, the fishing day was defined as lasting 16 hours (5:00 a.m. to 9:00 p.m.). Each day was divided into an early period (6:00 a.m. to 1:30 p.m.) or a late period (1:30 p.m. to 9:00 p.m.). The creel clerk then worked during either the early or late period on seven weekdays and three weekend days per two-week period. The sample was stratified to include approximately equal numbers of early and late periods.

A boat was used by the creel clerk to count anglers once every two hours. Additionally, the creel clerk attempted to interview anglers upon completion of their fishing trip. Shoreline anglers were normally interviewed when making hourly counts. During the last hour of a shift, the clerk also interviewed some of the remaining anglers in boats. Interview data included: length of trip, number in party, county of residence, species sought, number and size of fish harvested, number and size of largemouth bass caught and released and number of channel catfish caught and released. Boat and shoreline fishing data were recorded separately as were complete and partial trip interviews. Anglers were also asked to rate the satisfaction of their fishing trip on a scale of 1 to 5, with 1 being excellent and 5 being poor. Additionally, anglers were also asked if they would support a chemical renovation of the lake if it would improve the fishery.

Weekday and weekend data were expanded separately with federal holidays considered as weekend days. The data were then combined to obtain monthly estimates of fishing pressure and harvest. Species sought, the county of residence, responses to trip satisfaction, and responses to the lake renovation question were not expanded. Weights of fish harvested were estimated using Fisheries District 6 weights averages.

RESULTS

Fishing Pressure and Harvest Rates

From April 5 to October 29, 2004, the creel clerk conducted 4,223 interviews. Anglers fished an estimated 67,124.8 hours (107.9 hours/acre) at West Boggs. Fishing pressure was high throughout the creel survey with the highest pressure occurring in May and the lowest pressure in October (Table 1). Eighty-one percent of the fishing pressure came from boat anglers. Weekend anglers accounted for 54% of the angling pressure. The overall harvest rate during the creel period was 1.69 fish/hour in 2004.

Table 1. Monthly estimated fishing pressure in hours, West Boggs Creek Reservoir, April to October, 2004.

	April	May	June	July	August	September	October	Total Hrs
Weekday anglers	4,834.1	7,516.9	5,643.0	4,216.8	3,633.1	2,840.3	1,969.2	30,653.4
Weekend anglers	6,527.8	8,706.5	4,832.1	4,125.7	4,996.8	4,542.0	2,740.6	36,471.4
Shore anglers	1,680.0	2,781.1	2,379.3	1,487.8	1,585.9	1,677.8	758.0	12,349.9
Boat Anglers	9,681.8	13,442.2	8,095.8	6,854.7	7,044.0	5,704.5	3,951.8	54,774.9
Total anglers	11,361.8	16,223.4	10,475.1	8,342.5	8,629.9	7,382.3	4,709.8	67,124.8
Hours/per acre	18.3	26.1	16.8	13.4	13.9	11.9	7.6	107.9

Angler Preference

In 2004, the percent of anglers targeting largemouth bass (30%) and bluegill (29%) were almost identical. Anglers fishing for “anything” made up 20% and crappie fisherman made up 15%. People targeting catfish, panfish and combinations of other species comprised approximately 6% of the anglers. (Table 2). In 1999, anglers targeting largemouth bass (40%) and bluegill (34%) combined for nearly 75% of angling effort. Ten percent of the fishermen were fishing for anything and 4% were targeting crappie (Table 2). The percentage of anglers seeking “anything” crappie and channel catfish have all increased since 1999.

Table 2. Angler species preference, West Boggs Creek Reservoir, April to October, 1999 and 2004.

Preference species	1999 (%)	2004 (%)
Largemouth bass	39.8	30.1
Bluegill	33.9	29.3
Anything	10.7	20.6
Crappie	3.7	16.0
Channel catfish	0.1	3.2
Panfish		0.5
Bluegill and crappie	8.1	0.3
Bass and bluegill	3.1	0.1
Redear	0.4	0.1

Fish Harvest

In 2004, West Boggs anglers harvested an estimated 113,679 fish or 183 fish/acre (Table 3). There was a 5% increase in fish harvested from 1999. Bluegill accounted for the bulk of the harvest by number, followed by crappie, redear, bullhead, channel catfish and largemouth bass. Bluegill also comprised the bulk of the harvest by weight, followed by crappie, redear, largemouth bass, and channel catfish.

Table 3. Estimated number and weight of fish harvested, West Boggs Creek Reservoir, 2004.

	Harvest		Yield (lbs)	
Species	Number	Percent	Weight	Percent
Bluegill	70,736	62.2	10,189	43.6
Crappie	32,772	28.8	8,068	34.5
Redear	6,998	6.2	2,544	10.9
Bullhead	1,549	1.4	604	2.6
Channel catfish	801	0.7	730	3.1
Largemouth bass	611	0.5	1,238	5.3
Other sunfish	212	0.2	NW	
Total	113,679		23,373	

An estimated 70,736 bluegill were harvested at a rate of 1.05 fish/hour (Table 3). Bluegill comprised 62.2% of the harvest by number. An estimated 10,189 pounds were harvested. The average length of bluegill harvested was 5.8 inches (Appendix 1). Length range was 3.0 to 9.0 inches. The harvest rate in 2004 (1.05 fish/hour) was 43% higher than the 1999 harvest of 0.60 fish per hour. However, the mean size was almost two inches smaller than the 1999 mean length of 7.6 inches and yield decreased from 54.0 lbs./acre in 1999 to 16.4 lbs./acre in 2004. In 2004, anglers had the most success in the month of May (Appendix 2).

Crappie harvest was estimated to be 32,772 fish and comprised 28.8% of the total harvest by number. Crappie were harvested at a rate of 0.49 fish/hour, which is considerably higher than the 1999 rate of 0.09 fish/hour. The mean length also decreased from 1999 (9.4”) to 2004 (7.6”) by almost two inches. Harvested crappie ranged from 4.5 to 14.0 inches in length. An estimated 13 pounds/acre were harvested. In 2004, crappie harvest was highest in the month of April.

Largemouth bass harvest was 0.5% of total harvest by number. Largemouth bass were harvested at a rate of 0.009 fish/hour, which was much lower than the 1999

rate of 0.04 fish/hour. Bass were harvested at a rate of 1.99 lbs./acre in 2004. This was also a considerable decrease from 1999 when it was 13 lbs./acre. Harvested largemouth bass ranged from 14.0 to 19.0 inches in length.

Largemouth bass catch and release was also documented. An estimated 28,715 were caught and released during the seven-month survey. This was an 80% decrease in bass catch and released compared to 1999. Twenty-eight percent of the released bass were 14 inches and greater. The catch rate for all bass combined (harvested and released) was 0.44 bass/hour. In 1999, the catch rate for all bass was 1.09 bass/hour.

Redear sunfish accounted for 6.2% of the harvest by number. The harvest rate was 0.10 fish/hour. The harvest rate increased from 1999, but like bluegill and crappie the average length at harvest decreased. The length range of harvested redear was 6.0 to 12.0 inches with an average of 7.9 inches.

An estimated 801 channel catfish were harvested accounting for less than 1% of the total harvest by number. The creel schedule did not cover angling times past 9:30 pm. Catfish anglers beginning their outings past that time would have been missed in this study. Harvested channel catfish ranged in length from 8.0 to 23.0 inches and averaged 13.8 inches. Channel catfish have been stocked biennually at a rate of five per acre (3,110, eight inch fingerlings) since 1997. It is likely there are some big catfish from the last ten years of stocking and as word gets out of big catfish, fishing pressure will probably grow.

There were an estimated 1,549 bullheads harvested. Estimated harvest of bullhead increased almost 70% since 1999. Other fish harvested were warmouth, and green sunfish.

Angler Responses to Management Questions

Fishing parties were asked to rate their satisfaction with their fishing trip on a scale of 1 to 5, with 1 being excellent and 5 being poor. Only 0.6% of the parties rated trip satisfaction as being excellent while 79% rated it as “Good” (Table 6). The mean rating was 2.28, which indicates that most fishing parties felt their trip satisfaction was above “average”. In 1999, the mean trip satisfaction was below “average”. Angling preference groups were separated to determine if a particular group rated their trip satisfaction differently. Close to 80% of all the groups rated their trips as “good”. The next most common answer was “fair”. Just looking at anglers in this category (“fair”), bluegill and crappie anglers were more likely to rate their trip satisfaction as “fair”. Anglers caught more bluegill and crappie but the quality of the fish was smaller than in 1999. Bass anglers prefer to catch larger fish and harvest is not as important. Bass

harvested were larger but the overall catch was 80% lower than in 1999. As a result, bass anglers were the least likely to rate their trip as “fair”.

Table 4. Angler response to trip satisfaction question by preference groups, West Boggs Creek Reservoir, 2004.

	All Anglers	%	Bass Anglers	%	Bluegill Anglers	%	Anything	%	Crappie Anglers	%
Excellent	11	0.62	7	1.31	2	0.39	1	0.27	0	0.00
Good	1407	79.31	426	79.78	401	77.26	296	81.10	224	79.15
Fair	300	16.91	85	15.92	100	19.27	56	15.34	51	18.02
Mediocre	52	2.93	14	2.62	15	2.89	12	3.29	7	2.47
Poor	4	0.23	2	0.37	1	0.19	0	0.00	1	0.35
Total	1774		534		519		365		283	

Origin of Anglers

Anglers fishing at West Boggs came from 81 Indiana counties as well as out of state (Appendix 3). Daviess County accounted for 28% (including lake residents) of the total anglers followed by Martin (10%), Lawrence (9.4%) and Dubois (7.6%). Other counties with frequent usage included Marion, Greene, Cass, Madison and Jackson Counties. Out of state anglers accounted for 3% of the total. Bass fishing tournaments and camping facilities may explain why anglers from so many different counties utilize the West Boggs fishery. There were 41 registered bass tournaments in 2004. Pre-registration for tournament weekend dates consistently filled up for the five month bass tournament season.

Economic Value of the Fishery

Anglers fishing at West Boggs made an estimated 14,039 fishing trips during the creel period. Based on data from the U.S. Department of Interior, Fish and Wildlife Service (2001), anglers in Indiana spent an average of $36.56 for each day of fishing. Expenditures included food, lodging, transportation, equipment, licenses, and other fishing related items. Using the estimated cost of $36.56 each day of fishing, the estimated economic value of the West Boggs fishery from April to October 2004 was $513,265.84. In 1999, anglers made an estimated 30,778 trips to West Boggs, using the same cost per trip estimate $1,125,240.68 was spent. Before the renovation in 1989, it was estimated that anglers made 17,895 trips to West Boggs Lake.

Spot Check Survey of West Boggs June 14 and 21, 2004.

The last fisheries survey of West Boggs Lake was in 2003. The gizzard shad population was considered established and corrective measures to reduce the numbers were implemented. By chance, there was a winter-kill of shad in 2002 and in 2003 the

lake was drawn down approximately eight feet which was sufficient to cause shad kills throughout the winter. As part of a new work plan for investigating gizzard shad control measures, West Boggs is scheduled for annual electrofishing spot check surveys to determine the effects that winter draw downs have on gizzard shad and also the effect on largemouth bass and bluegill. The following are the results of a spot check survey from June 14 and 21, 2004.

Table 5. Relative abundance, total number and length range of fish collected, West Boggs Creek Reservoir, June 14 and 21, 2004.

Common Name of Fish	Number	Percent	Length Range (inches)
Bluegill	1441	70.1	1.8 - 8.3
Largemouth bass	323	15.7	1.8 -19.1
Gizzard shad	168	8.2	1.8 -11.2
Redear sunfish	71	3.5	2.3 - 9.7
Longear sunfish	30	1.5	2.7 - 6.9
Yellow bullhead	11	0.5	9.1 -12.7
Hybrid sunfish	6	0.3	3.8 - 7.6
Channel catfish	3	0.1	12.9 -27.6
Black bullhead	2	0.1	13.6 -14.0
Total	2,055	100	

Results

West Boggs Creek Reservoir was electrofished for a total of 1.5 hours. Six stations used in previous surveys were electrofished for fifteen minutes each. All fish species were collected. Total number and individual lengths to the nearest 0.1 inch were recorded. Scale samples for bass, bluegill, redear and gizzard shad were collected for age and growth determination.

A total of 2,055 fish representing eight species and one hybrid sunfish were collected. Bluegill were most abundant making up 70% of the collection followed by largemouth bass (15.7%), gizzard shad (8.2%), and redear (3.5%). The remaining species made up less than 3% of the total (Table 4).

The bluegill sample consisted of 1,441 individuals. Length range was 1.8 to 8.3 inches. Proportional stock density (PSD) of the collection was 27, as compared to 14.7 in 2003 (Appendix). The PSD is within the desired range for a balanced fishery according to Anderson and Neumann (1996). Average length was 4.9 inches. Bluegill eight inches and larger made up less than 1% of the sample. Growth was above average for all ages collected when compared to district impoundment averages. This

was similar to the 2003 survey when bluegill were reaching 8.5 inches in three years. The catch rate for bluegill was 960.7 fish/hour as compared to 524 per fish/hour in 2003.

There were 323 largemouth bass collected. Length range was 1.8 to 19.1 inches. Legal size bass accounted for 10.2% of the collection as compared to 37.8% in 2003. The largemouth bass PSD was 32. This is outside the range of 40 to 60 considered desirable for a balanced bass/bluegill fishery. In 2003, PSD for bass was 70. Catch rate for bass increased from 127.3 fish/hour in 2003 to 215.3 fish/hour in 2004. Growth for bass was below average for ages 1 and 2 and above average for older fish. This is often the case in lakes with shad based forage. Unlike the younger fish, bass reaching ages 3 and 4 are large enough to benefit from the fast growing shad forage.

The gizzard shad catch rate decreased from 929.3 fish/hour in 2003 to 112 fish/hour in 2004. The majority of the shad killed throughout the winter appeared to be in the 1 to 2 inch size range. YOY shad are more sensitive to draw down conditions. After two consecutive years of shad winter-kills, the dominant year class in 2004 was age 1 fish (2002). A successful shad winter-kill in 2003-04 reduced recruitment to where the 2002 year class remains the dominant year class.

There were 71 redear collected. This was similar to the 2003 collection. Length range was 2.3 to 9.7 inches. Forty-four percent of redear were 7 inches and greater as compared to 62% in 2003. Growth remains above average for all ages.

Other species collected were longear sunfish, yellow and black bullhead, hybrid sunfish and channel catfish.

Discussion

The West Boggs Reservoir renovation in 1994 was successful in creating tremendous bass and bluegill fishing opportunities. In the last creel survey in 1999, Sapp indicated West Boggs Creek was an excellent fishery with a great deal of angling pressure focused on both bass and bluegill. In 1989, (pre-renovation) anglers fishing for “anything” rated first for angling preference. In the 2004 creel survey, bass and bluegill still received the majority of the attention, although the percentage of anglers seeking crappie and “anything” increased since 1999.

A fishery survey conducted in 2003 confirmed the reintroduction of shad to the lake (Schoenung 2003). The expanding gizzard shad population has impacted this fishery. Recruitment of YOY bass and bluegill appeared to be poor and size structure of both species has shifted towards smaller fish. This was also confirmed through the 2004 creel survey. The quality of panfish decreased since 1999 as shown by average length and pounds per acre harvested. Largemouth bass average length at harvest actually

increased. However, the harvest and the number of bass caught and released decreased by 82%. Overall, angler satisfaction rated good. In 1999, angling satisfaction was below average, yet the quality of fishing was much better. Higher fishing pressure and media hype may have raised expectations beyond the average fishing day.

The lack of age 1 shad in the 2004 survey and the dominance of the 2002 year class indicate that the past two drawdowns have reduced the shad recruitment past age 1. Drawdowns are only successful if the right combination of cold weather and drop in water volume are achieved. The inconsistency of this measure of shad control will always play a role in recruitment of all species. The presence of small shad in the winter-kill indicate the population of shad is high enough that growth of one year old shad has slowed. If the shad population gets too big, shad recruitment will suffer as well. The most useful part of a shad population is YOY to age 1 fish. A successful winter-kill of shad will ensure a new year class of shad the following spring.

Shad numbers have increased to the point where bluegill and bass production has been reduced. Inconsistent recruitment and high harvest is reducing the quality of the bluegill fishery. Bass will also struggle with recruitment as bass fry compete for forage. Bass growth is below average at age 1 and 2 and above average for age 3 and above. This is common for lakes with shad based forage. Growth is reduced until the bass are large enough to eat the fast growing shad. Overall, bass growth is slightly lower compared to the 2003 survey.

Winter drawdowns will be conducted through 2006. To evaluate the success of this control measure, electrofishing spot check surveys will be conducted as outlined in the workplan. Trends in bass, bluegill and gizzard shad growth and catch rates will aide in future management of West Boggs Creek Reservoir. The volunteer bass tournament catch reports will also be used to follow the status of the bass population.

Submitted by: Dave Kittaka, Fisheries Biologist
Date: February 23, 2005

Approved by: _____
Brian M. Schoenung, Fisheries Supervisor
Date: May 18, 2005

LITERATURE CITED

Anderson, R.O. and R.M. Neumann. 1996. Length weight and associated structural indices. Pg 47-481 in B.R. Murphy and D.W. Willis, editors. Fisheries Techniques, 2nd edition. American Fisheries Society, Bethesda, MD

Hudson, G., and S.T. Shipman. 1980. Creel survey guidelines. Indiana Department of Natural Resources. Indianapolis. 12 pp.

U.S. Department of the Interior, Fish and Wildlife Service. 1998. 1996 national survey of fishing, hunting and wildlife-associated recreation, Indiana. U.S. Department of the Interior, Fish and Wildlife Service. Washington, D.C. 47pp.

Sapp, S., and B.M. Schoenung. 2000. Angler survey of fishing pressure, fish harvest, and economic value of the West Boggs Creek Reservoir fishery. 1999. Indiana Department of Natural Resources. Indianapolis.

Schoenung, B. M., 2004. West Boggs Creek Reservoir fish management report, 2003. Indiana Department of Natural Resources. Indianapolis. 3pp

Appendix 1. Length frequency of fish harvested at West Boggs Creek Reservoir, 2004.

Length	Species				
1/2 inch	Bluegill	Crappie	Redear	Channel Catfish	Largemouth bass
3	1				
3.5	8				
4	143				
4.5	186	1			
5	3220	146	40		
5.5	2777	315	69		
6	**2616**	818	154		
6.5	1411	684	162		
7	1186	1194	227		
7.5	404	**621**	191		
8	274	1134	**240**	1	
8.5	15	273	161	0	
9	11	719	206	0	
9.5		88	90	0	
10		439	122	1	
10.5		54	47	0	
11		195	58	29	
11.5		5	16	2	
12		3	18	21	
12.5		0	3	2	
13		0		27	
13.5		0		2	
14		3		**40**	24
14.5				0	22
15				10	**24**
15.5				0	15
16				26	31
16.5				0	7
17				5	12
17.5				1	11
18				2	12
18.5				0	2
19				4	2
19.5				0	
20				1	
20.5				0	
21				1	
21.5				0	
22				0	
22.5				0	
23				2	
Total *	12,252	6,692	1,804	177	162

*Not all harvested fish were measured
Bold indicates Average Length

Appendix 2. Total estimated fish harvest by month and fish harvest per hour at West Boggs Creek Reservoir, 2004

Harvest	April	May	June	July	August	September	October	Total
Crappie	7,465	3,770	2,406	6,374	5,650	4,647	2,460	32,772
Bluegill	4,118	21,299	7,029	11,301	10,104	11,124	5,761	70,736
Redear	551	3,390	1,171	808	368	468	242	6,998
Largemouth bass	135	41	184	171	74	0	6	611
Channel Catfish	0	127	294	189	98	65	28	801
Bullhead	19	531	351	291	99	170	88	1,549
Other sunfish	10	76	40	22	18	34	12	212
Total harvest	12,298	29,234	11,475	19,156	16,411	16,508	8597	113,679
Fish harv/hour	1.08	1.80	1.10	2.30	1.90	2.24	1.83	1.69

Appendix 3. County of origin for anglers fishing West Boggs Creek Reservoir, April to October, 2004.

Code	County	Parties	Percent	Cont.	County	Parties	Percent
14	Daviess	302	17.0	67	Putnam	3	0.2
0	Lake resident	199	11.2	87	Warrick	3	0.2
51	Martin	184	10.4	73	Shelby	3	0.2
47	Lawrence	167	9.4	27	Grant	3	0.2
19	Dubois	136	7.7	22	Fountain	3	0.2
49	Marion	63	3.6	64	Porter	3	0.2
93	out of state	53	3.0	16	Decatur	2	0.1
28	Greene	51	2.9	61	Parke	2	0.1
9	Cass	47	2.6	39	Jefferson	2	0.1
48	Madison	41	2.3	63	Pike	2	0.1
36	Jackson	37	2.1	12	Clinton	2	0.1
53	Monroe	35	2.0	69	Ripley	2	0.1
34	Howard	31	1.7	56	Newton	2	0.1
40	Jennings	27	1.5	18	Delaware	2	0.1
7	Brown	27	1.5	72	Scott	2	0.1
59	Orange	23	1.3	74	Spencer	2	0.1
26	Gibson	18	1.0	17	Dekalb	1	0.1
42	Knox	17	1.0	5	Blackford	1	0.1
43	Kosciusko	15	0.8	57	Noble	1	0.1
41	Johnson	15	0.8	38	Jay	1	0.1
44	Lagrange	14	0.8	70	Rush	1	0.1
32	Hendricks	13	0.7	75	Starke	1	0.1
3	Bartholomew	13	0.7	76	Steuben	1	0.1
82	Vanderburgh	12	0.7	83	Vermillion	1	0.1
33	Henry	9	0.5	78	Switzerland	1	0.1
54	Montgomery	9	0.5	92	Whitley	1	0.1
58	Ohio	9	0.5	1	Adams	1	0.1
8	Carrol	8	0.5	89	Wayne	1	0.1
52	Miami	8	0.5	4	Benton	1	0.1
45	Lake	8	0.5		Total	1774	100
24	Franklin	7	0.4				
55	Morgan	7	0.4				
66	Pulaski	7	0.4				
20	Elkhart	7	0.4				
79	Tippecanoe	7	0.4				
50	Marshall	7	0.4				
35	Huntington	6	0.3				
46	LaPorte	6	0.3				
31	Harrison	6	0.3				
80	Tipton	6	0.3				
2	Allen	6	0.3				
77	Sullivan	6	0.3				
60	Owen	6	0.3				
6	Boone	5	0.3				
10	Clark	5	0.3				
30	Hancock	5	0.3				
29	Hamilton	5	0.3				
11	Clay	5	0.3				
13	Crawford	4	0.2				
37	Jasper	4	0.2				
65	Posey	4	0.2				
85	Wabash	4	0.2				
88	Washington	4	0.2				
15	Dearborn	3	0.2				

APPENDIX 4

LARGEMOUTH BASS, BLUEGILL, REDEAR AND GIZZARD SHAD DATA PAGES FROM THE SPOT CHECK SURVEY, WEST BOGGS CREEK RESERVOIR, JUNE 14 AND 21, 2004

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF BLUEGILL AT WEST BOGGS

TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0	18	1.2		1	20.0				
2.5	43	3.0		1	20.5				
3.0	62	4.3		1,2	21.0				
3.5	95	6.6		1,2	21.5				
4.0	133	9.2		2	22.0				
4.5	269	18.7		2	22.5				
5.0	269	18.7		2	23.0				
5.5	180	12.5		2	23.5				
6.0	192	13.3		2,3	24.0				
6.5	115	8.0		2,3,4	24.5				
7.0	49	3.4		2,3	25.0				
7.5	11	0.8		2,3	25.5				
8.0	3	0.2		3	26.0				
8.5	3	0.2		3	TOTAL	1442	100.0		
9.0									
9.5									
10.0									
10.5									
11.0									
11.5									
12.0									
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	960.7/hour	GILL NET CATCH	0	TRAP NET CATCH	0

* Average weights derived from district averages

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF LARGEMOUTH BASS AT WEST BOGGS									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0	1	0.3		5
1.5					19.5				
2.0	1	0.3		YOY	20.0				
2.5	1	0.3		YOY	20.5				
3.0					21.0				
3.5					21.5				
4.0	4	1.2		1	22.0				
4.5	13	4.0		1	22.5				
5.0	31	9.6		1	23.0				
5.5	41	12.7		1	23.5				
6.0	23	7.1		1,2	24.0				
6.5	16	5.0		1,2	24.5				
7.0	6	1.9		1,2	25.0				
7.5	11	3.4		1,2	25.5				
8.0	10	3.1		2	26.0				
8.5	22	6.8		1,2	TOTAL	323	100		
9.0	20	6.2		1,2					
9.5	28	8.7		1,2					
10.0	22	6.8		2,3					
10.5	11	3.4		2					
11.0	6	1.9		1,2,3					
11.5	1	0.3		3					
12.0	4	1.2		2,3,4					
12.5	2	0.6		3,4					
13.0	8	2.5		3,5					
13.5	9	2.8		3,4					
14.0	7	2.2		3,5					
14.5	4	1.2		4,5					
15.0	5	1.5		3,4					
15.5	3	0.9		4					
16.0	2	0.6		4					
16.5	4	1.2		3,4,5					
17.0	3	0.9		4,5					
17.5	2	0.6		4,5					
18.0	2	0.6		5,6					
18.5									

ELECTROFISHING CATCH	215.3/hour	GILL NET CATCH	0	TRAP NET CATCH	0

* Average weights derived from district averages

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF GIZZARD SHAD AT WEST BOGGS

TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0	1	0.6		YOY	20.0				
2.5	1	0.6		YOY	20.5				
3.0	1	0.6		YOY	21.0				
3.5	1	0.6		YOY	21.5				
4.0					22.0				
4.5					22.5				
5.0					23.0				
5.5					23.5				
6.0					24.0				
6.5	2	1.2		1,2	24.5				
7.0	10	6.0		1,2	25.0				
7.5	44	26.2		2	25.5				
8.0	53	31.5		2	26.0				
8.5	17	10.1		2	TOTAL	168	100.0		
9.0	12	7.1		1,2					
9.5	12	7.1		1,2					
10.0	4	2.4		1,3					
10.5	6	3.6		1,2,3					
11.0	4	2.4		1,2					
11.5									
12.0									
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	112.0/hour	GILL NET CATCH	0	TRAP NET CATCH	0

* Average weights derived from district averages

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF GREEN SUNFISH AT WEST BOGGS									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5	1	3.3			20.5				
3.0					21.0				
3.5	2	6.7			21.5				
4.0					22.0				
4.5	5	16.7			22.5				
5.0	2	6.7			23.0				
5.5					23.5				
6.0	11	36.7			24.0				
6.5	8	26.7			24.5				
7.0	1	3.3			25.0				
7.5					25.5				
8.0					26.0				
8.5					TOTAL	30	100.0		
9.0									
9.5									
10.0									
10.5									
11.0									
11.5									
12.0									
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	20.0 /hr	GILL NET CATCH		TRAP NET CATCH	

* Average weights derived from district averages

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF YELLOW BULLHEAD AT WEST BOGGS									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5					22.5				
5.0					23.0				
5.5					23.5				
6.0					24.0				
6.5					24.5				
7.0					25.0				
7.5					25.5				
8.0					26.0				
8.5					TOTAL	11	100		
9.0	1	9.1							
9.5	1	9.1							
10.0	2	18.2							
10.5	3	27.3							
11.0	1	9.1							
11.5	2	18.2							
12.0									
12.5	1	9.1							
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	7.3 /hr	GILL NET CATCH		TRAP NET CATCH	

* Average weights derived from district averages

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF REDEAR AT WEST BOGGS CREEK RESERVOIR									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5	2	2.8		1	20.5				
3.0	5	7.0		1	21.0				
3.5	7	9.9		1	21.5				
4.0	7	9.9		1	22.0				
4.5	8	11.3		1	22.5				
5.0	3	4.2		1,2	23.0				
5.5	3	4.2		2	23.5				
6.0	3	4.2		2	24.0				
6.5	2	2.8		2	24.5				
7.0	5	7.0		2	25.0				
7.5	8	11.3		2	25.5				
8.0	6	8.5		2	26.0				
8.5	5	7.0		2,3	TOTAL	71			
9.0	4	5.6		2,3,4					
9.5	3	4.2		3,4					
10.0									
10.5									
11.0									
11.5									
12.0									
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	47.3/hour	GILL NET CATCH		TRAP NET CATCH	

* Average weights derived from district averages

Appendix 5. Back calculated lengths at age for fish collected at West Boggs Creek Reservoir, June 14 and 21, 2004.

Species	YEAR CLASS	NUMBER OF FISH AGED	SIZE RANGE (Inches)	BACK CALCULATED LENGTH (inches) AT EACH AGE							
Bluegill				I	II	III	IV	V	VI	VII	VIII
Intercept=0.8	2003	15	1.8 - 3.6	1.8							
	2002	25	3.1 - 7.3	2.1	4.2						
	2001	18	5.9 - 8.3	2.3	5.3	6.7					
	2000	1	6.7 - 6.7	2.3	4.8	5.7	6.3				
	AVERAGE LENGTH			2.1	4.7	6.7					
	NUMBER AGED			15	25	18	1				

Species	YEAR CLASS	NUMBER OF FISH AGED	SIZE RANGE (Inches)	BACK CALCULATED LENGTH (inches) AT EACH AGE							
Largemouth bass				I	II	III	IV	V	VI	VII	VIII
Intercept=0.8	2003	30	4.0 - 11.0	4.4							
	2002	32	6.0 - 12.2	4.1	8.0						
	2001	13	9.8 - 16.2	3.9	9.4	12.0					
	2000	16	11.9 - 17.5	5.0	9.7	12.5	14.2				
	1999	12	13.2 - 19.1	4.5	8.7	11.6	13.9	15.5			
	1998	1	17.8 - 17.8	5.5	10.0	13.0	14.3	16.2	17.5		
	AVERAGE LENGTH			4.4	9.0	12.1	14.0	15.5			
	NUMBER AGED			30	32	13	16	12	1		

Species	YEAR CLASS	NUMBER OF FISH AGED	SIZE RANGE (Inches)	BACK CALCULATED LENGTH (inches) AT EACH AGE							
Gizzard shad				I	II	III	IV	V	VI	VII	VIII
Intercept=0.0	2003	9	6.5-11.2	6.1							
	2002	31	6.6-11.0	5.2	8.0						
	2001	2	10.1-10.7	5.5	7.9	10.1					
	AVERAGE LENGTH			5.6	8.0						
	NUMBER AGED			42	33	2					

Species	YEAR CLASS	NUMBER OF FISH AGED	SIZE RANGE (Inches)	BACK CALCULATED LENGTH (inches) AT EACH AGE							
Redear sunfish				I	II	III	IV	V	VI	VII	VIII
Intercept=0.6	2003	19	2.3 -4.9	2.5							
	2002	26	4.9 - 8.8	2.6	5.9						
	2001	3	8.5 - 9.3	2.0	5.8	8.2					
	2000	2	9.0 - 9.7	2.2	4.9	7.8	9.0				
	AVERAGE LENGTH			2.4	5.8	8.2					
	NUMBER AGED			19	26	3	2				

*Not included in average length calculations.